Ch:03

Emergence of IoT:

- IoT Growth- A statistical View,
- Application area of IoT,
- Characteristics of IoT,
- Things in IoT, IoT stack,
- Enabling Technologies, IoT challenges,
- IoT levels,
- Cyber physical systems versus IoT,
- Wireless sensor Network with IoT

IoT Challenges

- As with any application, while building an IoT application one faces many challenges - both technical and non-technical.
- The following are some of the challenges.
- 1. Security/Personnel safety:
- This is one of the most significant challenges to confront. Since a number of devices are used in IoT, user data becomes more vulnerable to theft.
- So, it becomes necessary to make sure that the data is safe.
- Even the best social media websites get into trouble for misusing a customer's data. Poor security features can let attackers damage the whole network.
- People's personal safety is also a concern and challenge.
- The implants and wearables used by people should be safe and the devices should not cause any physical damage to the person using it.
- Since many devices are in the loop, if one device gets attacked, then the rest of the devices could also become vulnerable.

- 2. Privacy:
- One could be tracked/monitored by anyone, as we are connected 24 x 7 to the Internet.
- At times, one could be tracked without the host's permissions in place.
- So, there is a threat on user data and raises a question on user privacy: "How do we ensure that the data that is sensed/collected from the user is with their permission?"

- 3. Data extraction with consistency from complex environments:
- It is a huge challenge to sense/extract data from complex environments.
- Let us consider the following question: "How do we sense the data input (temperature, humidity, etc.) during commute from a vehicle?" Let us assume that a highly temperature-sensitive material is being transported, where the measurement is always expected to be accurate.
- Variation in temperature could also damage the products being transported, particularly if medicines/ drugs are being transported. In such a case, the temperature maintained is very critical and should be accurately monitored. In this case, if the temperature is about to change, then the corrective action has to be taken to ensure that the medicines/drugs are not damaged.
- IoT-based applications, the Internet is needed and is mandatory in most places. In hilly regions, which are technically not so up-to-date terrains, providing Internet 24×7 may not be an easy task. Hence, data extraction and storage in the cloud could be more challenging. Extracting data inside a room is different from extracting data from an open environment.

- 4. Connectivity:
- This is a serious challenge that the IoT world must acknowledge. Since the Internet is itself a giant collection of networks and devices and IoT is a part of it, requirement of wired and wireless connectivity is a necessity.
- The usage of frequency/ spectrum is also to be noted (2.4 GHz band is the optimal band everywhere).
- There are spectrum regulations to be followed based on the country for which the application is being developed.
- Hence, understanding the connectivity requirements is important.

- 5. Power requirements:
- All the IoT devices require power and most of them are battery operated.
- Even though we now have long-lasting batteries that are economical, demand for power is on the rise.
- Hence, usage of green power sources such as solar and wind should be motivated.
- If the power requirements are met appropriately, IoT can be even more powerful.

- 6. Complexity involved:
- IoT is not easy.
- It needs a lot of different domains to integrate into a cohesive system.
- There is very limited expertise available in the market, but the growth is very rapid.
- The toolkits, software and hardware are not abundant and real skill is required to build an application.
- Over the next few years, IoT would get more and more technology experts to work.

- 7. Storage:
- Cloud is becoming mandatory for the data to be stored and analysed.
- The challenge with respect to this aspect is connected to the following points:
- a. Which cloud do we use (private, public, or hybrid)?
- b. How do we identify the service provider?
- c. How much does it cost?
- d. Do we really need cloud?

Thank You